Comparative study between microvascular tone regulation and rheological properties of blood in patients with type 2 diabetes mellitus

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Aim: To study the changes of the skin blood flow responses to cold stress in patients with diabetes mellitus type 2 through wavelet analysis of the peripheral skin temperature oscillations and to estimate their relationship with the blood viscosity values.

Materials and Methods: The amplitudes of the skin temperature pulsations (ASTP) were monitored by “Microtest” device (“FM-diagnostics”, Russia); the whole blood viscosity and the shear stresses were measured by viscometer Contraves LS30, (Switzerland) at 11 shear rates of 0.0237s⁻¹ to 128.5 s⁻¹ in 9 healthy subjects and in 30 patients with type 2 diabetes mellitus. Power law and Herschel-Bulkley (HB) equations were applied to describe the blood rheology. Both models include consistency (a) and flow index (m), and the HB also gives the yield stress (τ₀). The Spearman rank correlations between these parameters and the ASTP in the frequency ranges, corresponding to the myogenic, neurogenic and endothelial mechanisms were calculated.

Results: The ASTP values decreased when the blood viscosity increased. The correlation analysis revealed good ASTP–m (r>0.5) and ASTP–a (r<−0.5) relationships in the endothelial range, while the ASTP–τ₀ correlation was weaker (r≈−0.4). These correlations became lower for the ASTP during the cold stress.

Conclusions. The results prompt manifestation of endothelial dysfunction in patients with type 2 diabetes.

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